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# Addressing Rural-urban Disparities in Access to Renal Transplantation in Pakistan: A Narrative Review

## ABSTRACT

**Background:** Pakistan's healthcare system is marked by stark rural-urban disparities, with 62% of the population residing in rural areas but only 20% of transplant facilities located outside major cities like Karachi and Lahore. This inequity exacerbates the burden of end-stage renal disease (ESRD) for rural patients, who often cannot afford travel or treatment costs.

**Objective:** This narrative review assesses rural-urban disparities in access to renal transplantation in Pakistan and explores strategies to improve equity in transplant care.

**Methods**: We analyzed hospital data, patient registries, and policy reports from 2015 to 2024, focusing on transplant outcomes and access challenges in rural Punjab, Sindh, and Khyber Pakhtunkhwa. We also reviewed mobile health initiatives and public-private partnership models.

**Results**: Rural patients face a 40% lower likelihood of receiving a transplant compared to urban patients, primarily due to transportation barriers and lack of local dialysis centers. Only 5% of rural ESRD patients are referred to transplant centers annually. Initiatives like SIUT's mobile dialysis units have reached 10,000 rural patients since 2018, but transplant follow-up remains challenging due to limited local expertise.

**Conclusion**: Bridging rural-urban disparities requires decentralized transplant care, mobile health units, and training for rural healthcare providers. Future research should focus on cost-effective models to expand transplant services to underserved regions.

***KEYWORDS:*** *Renal Transplantation, Rural-urban Disparity, Pakistan, Healthcare Access, Mobile Health*

## INTRODUCTION

End-stage renal disease (ESRD) is a growing global health concern. Approximately 2.6 million people need renal replacement therapy, and this number is expected to reach 5.2 million by 2030 due to increasing diabetes and hypertension rates (1). In low- and middle-income countries like Pakistan, accessing kidney transplantation and other essential treatments remains a significant challenge.

Pakistan with a population over 240 million, is divided between rural and urban area in which 62% of its population living in rural areas (2). Only 20% of transplant facilities are located outside major cities like Karachi, Lahore, and Islamabad, which results in unequal access to healthcare services to people living in underserved areas who face transportation challenges and financial burdens (3).

Renal transplantation represents the most effective treatment for End Stage Renal Disease (ESRD), providing enhanced quality of life and improved survival rates compared to dialysis (4)(5). In Pakistan, the national transplant program faces significant challenges with less than 1,000 transplants each year, while over 20,000 patients are estimated to be in need. (6). Patients in rural areas encounter difficulties such as limited access to dialysis facilities, transportation difficulties and a lack of awareness regarding transplant therapy. Research studies indicate that individuals living in rural areas are 40% less likely to receive a transplant than those in urban areas which highlights the

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necessity of targeted interventions in these underserved communities (7,8).

The high expenses of travel and post-transplant care give rise to the existing disparity, leading to financial hardships for impacted families. To address these issues, a more effective and comprehensive strategy is needed which might include decentralization of transplant services, the use of mobile initiatives like SIUT's mobile dialysis units, which have successfully reached underserved populations and have served over 10,000 rural patients since 2018 (6). However, ensuring the sustainability of long-term care poses a significant challenge. Public and private collaborations along with policy represents a potential strategy for closing this gap, but their implementation in diverse socio-economic context of Pakistan is itself a challenge.

To address these problems and to highlight the existing healthcare problems in rural areas, this narrative review aims to provide a detailed assessment on rural-urban disparities in access to renal transplantation in Pakistan by analyzing data from patients registered in different hospitals across different cities of Sindh, Punjab and Khyber Pakhtunkhwa and policy reports from 2015 to 2024 to observe recent developments.

The objective of this study is to propose better practical strategies to improve quality of transplant care specifically in rural areas, moreover, highlighting potential research directions including cost-effective models for delivering services, to guide policymakers and healthcare stakeholders in addressing this important public health concern.

## METHODOLOGY

### Purpose

This narrative review aims to analyze existing literature and data of rural and urban areas who have difficulty in getting access to renal transplantation in Pakistan. We ensured transparency and credibility in the analysis of healthcare gaps. This approach provided a proper framework for assessing transplant outcomes and identifying practical strategies to improve transplant care.

### Search Strategy

The review included a detailed search of relevant literature and data sources from 2015 to 2024. Key terms such as "renal transplantation," "rural-urban disparity," "Pakistan healthcare," "end-stage renal disease," and "mobile health" were used. Searches were conducted from academic databases (e.g., PubMed, Google Scholar), government health portals, and organizational websites, with a primary focus on obtaining hospital data, patient registries, and policy documents related to transplant services (2,6,9).

### Inclusion and Exclusion Criteria

Our inclusion criteria included studies that offered comprehensive insights into transplant access, barriers, or outcomes in Pakistan, particularly comparing urban areas with rural areas, focusing on major provinces such as Punjab, Sindh, and Khyber Pakhtunkhwa, where most transplant activities and rural areas are found. (10). Data from 2015 and 2024 is taken to ensure recent insights to the healthcare services. Exclusion criteria included those studies without primary data, those which focused on non-transplant renal care, and those outside the specified region or timeline (11).

### Data Sources

We gathered information from hospital records of prominent transplant centers in Karachi, Peshawar, and Lahore, Patient registries from Sindh Institute of Urology and Transplantation (SIUT) and other local health authorities as well as policy reports from the Pakistan Health Ministry and International health organizations such as the World Health Organization (WHO) (9). to outline the measures and outcomes related to renal transplant. The research also included data of mobile health initiatives and public-private partnership models conducted by SIUT and

the Pakistan Medical Association (PMA) for detailed assessment (12).

### Limitations

The analysis presents several limitations including gaps in comprehensive rural-specific data, insufficient systematic record-keeping which leads to potential gaps in patient information and outcome statistics. Additionally, the varying manual reporting standards and language differences among provinces impact the comparability of data (11,13). This highlights the necessity for improvements in data collection methods in rural areas of Pakistan to enhance the accuracy of future research (10).

## RESULTS

### Overview of Transplant Access

Data from patient registries, policy analyses, and hospital records from 2015 to 2024 highlights important issues in access to kidney transplantation. With 62% of the population living in rural areas, only 20% of transplant centers are situated outside of major urban areas like Karachi and Lahore. This disparity in regional access limits the availability of critical care for patients suffering from end-stage renal disease (ESRD) patients.

### Rural vs. Urban Disparities

Research studies show thar rural patients are 40% less likely than patients in urban areas to receive kidney transplant highlighting the need to provide immediate access to this life-saving procedure. Transportation difficulties and limited access to local dialysis centers are important contributing factors to this discrepancy. Data shows that only 5% of rural ESRD patients are referred to transplant centers annually (14). Following table outlines these disparities:

| Region | % of Population | % of Transplant Facilities | Transplant Likelihood (Rural vs Urban) | Annual Rural referrals to Transplant Centers |
|---|---|---|---|---|
| Rural Areas | 62% | 20% | 40% lower | 5% |
| Urban Areas | 38% | 80% | Baseline | N/A |

**TABLE 1: Rural-Urban Disparities in Renal Transplantation Access in Pakistan**

These findings highlight the regional and economic issues relevant to access healthcare facilities in the neglected areas of Pakistan (15,16).

Despite these difficulties, the projects undertaken by the Sindh Institute of Urology and Transplantation (SIUT) regarding mobile dialysis units provide some consolation to End Stage Renal Disease (ESRD) patients requiring urgent transplant surgery. SIUT promises advanced care to 10,000 rural patients since 2018 closing the healthcare gap. However, post operative care for transplant remains a problem due to the limited availability of local medical expertise. Providing training programs for rural healthcare workers and establishing decentralized transplant care units can improve outcomes (6,17,18). In addition to this, hybrid healthcare systems involving both private and public sectors and the application of mobile health services have been suggested as some possible solutions to bridge these gaps (19).

## DISCUSSION

### Interpretation of Finding

Rural and underserved areas face significant challenges in accessing healthcare facilities. Research study shows that people living in rural areas usually must travel distances to reach hospitals, with an average of 30–60 minutes to travel as

compared to urban residents (20). This delay can lead to severe outcomes, especially for conditions that requires timely interventions like cardiovascular diseases. Gaps in expertise—such as lack of specialists and inadequate training for primary care providers affects the quality of care with rural healthcare workers often feeling less confident to manage complex cases which is a challenge itself (21).

## Comparison with Global Context

Globally, countries like India and Brazil have introduced innovative models to address rural healthcare problems which offers valuable insights and sets a potential example for underdeveloped countries. India's National Rural Health Mission (NRHM), launched in 2005 took the initiative of recruiting Accredited Social Health Activists (ASHAs) to facilitate people living in rural areas facing health care related problems. ASHAs' primary focus is to provide community-based care, health education particularly improving child and maternal health outcomes (22,23). Similarly, Brazil's Family Health Strategy has reduced hospital admissions by 15% through their initiatives to provide healthcare facilities including decentralizes care and multidisciplinary teams (24). In comparison to many developed countries, including the United States are completely dependent on centralized hospital systems. These global models suggest effective community-driven and decentralized approaches to reduce healthcare disparities (25).

## Challenges and Barriers

Challenges in rural areas includes transportation barriers, specifically in regions with underdeveloped road networks or limited public transport. Research studies shows that transportation issues cause 20% of rural patients to miss their appointments (20). Rural residents face challenges in consulting with a specialist doctors, as few agrees to serve in rural settings (21). Financial burden—rural residents spending a greater portion of their income on travel and medications (20,26,27). Furthermore, lack of proper policy and insufficient investment in rural healthcare infrastructure causes a great impact as governments often prioritize urban-centric models which results in neglecting rural areas (28)(29)(30).

## Proposed Strategies

To address these challenges, new decentralized healthcare units, such as mobile clinics and telemedicine hubs should be introduced in rural and underserved areas. Mobile clinics can bring primary and preventive care directly to rural communities, reducing transportation barriers. A pilot study in rural Australia showed a 25% increment in preventive screenings following mobile clinic deployment (27). Telemedicine can also bridge expertise gaps by connecting rural providers with urban specialists, with evidence showing a 30% improvement in chronic disease management through tele-consultations (31). Upskilling rural healthcare workers through targeted training programs is another critical strategy (21). Finally, policy reforms should offer incentivize like bonuses or loan forgiveness to attract specialist to come and serve in underserved areas as seen in Brazil's Family Health's approach (24)(32).

## Future Research Directions

Further investigations are needed to address important research gaps. Firstly, cost-effectiveness studies of decentralized healthcare models, such as mobile clinics and telemedicine, are essential to inform resource allocation decisions. Existing data is limited to small-scale, which lacks broader perspective (27). Secondly, long term studies assessing the impact of training programs on rural healthcare outcomes can provide valuable insights for effective interventions. Thirdly, understanding the problems faced by patients, including cultural and linguistic factors is important for taking better interventions and to meet the healthcare related needs of diverse populations (28). Lastly, comparing global rural healthcare models can help in implementing best practices in settings that includes both urban and rural areas (22).

## CONCLUSION

### Summary of Key Insights

The key insight of this review is to highlight disparities in access healthcare facilities and outcomes across socioeconomic, racial, and regional demands which requires immediate attention. Studies shows that underserved groups face multiple challenges such as lack of insurance coverage, limited healthcare infrastructure in rural areas, and systemic drawback in care delivery. To address these problems, promising solutions should be introduced including tele-health services, increase in funds for community health centers, and proving cultural awareness training to healthcare providers. Evidence from initiatives like Healthy People 2030 highlights the need for targeted interventions (33).

### Implications for Policy and Practice

These disparities demand urgent policy reforms and evidence-based strategies for fair distribution of resources and enforcement of equal measures in both rural and urban healthcare settings. Policymakers should prioritize funding for research to reduce coverage gaps. Practitioners must follow patient-centered care models, to improve outcomes for underserved populations. A call to action is important: stakeholders must collaborate to ensure equal healthcare access for all. By working together, we can address these inequities and promote better healthcare system for renal transplantation in both rural and urban areas of Pakistan.

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